

Prototype Peaking-Capacitor Sparkplug Body

Under the SNL NM Small Business Assistance Program, a prototype sparkplug body has been fabricated in partnership with Combustion Technology (CT). CT is developing a proprietary peaking-capacitor sparkplug to increase the performance and fuel efficiency of automotive engines. The prototype consisted of alumina ceramic with an internal thick film gold conductor and an insulating glaze (Figures 1 and 2). This

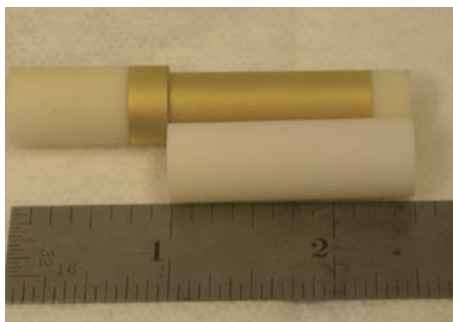


Figure 1: Metallized body (top) and insulating sleeve (bottom).

prototype has enabled CT to evaluate their design under high voltage conditions without experiencing high voltage breakdown (Figure 3).

Combustion Technology and its Enerpulse division have teamed with Sandia on two Cooperative Research and Development Agreements (CRADAs). In the first,



Figure 2: Completed glazed assembly.

Sandia acted as a Red Team to review the design of a 2-piece high energy sparkplug, which has found markets among auto racers, car and truck enthusiasts, and other aftermarket applications. But a 2-piece sparkplug is not acceptable to the large auto makers, who formulated standards for advanced ignition components in 1998. The second CRADA was aimed at developing an ISO-standard sparkplug, and involved miniaturization

Sparkplug, Continued, page 2



Figure 3: Prototype body under test conditions of 25KV at 120 Hz, with a gap of 0.410." Note the bluish-white spark indicating high-energy discharge.

From the Director

Gil Herrera reflects on his first year as the Mfg. S&T Director:

It has been just over a year since I joined the Center, and as we also bring to an end FY2004, I thought it appropriate to make a few comments about the year. It has been a busy year, with many significant technical successes, scores of satisfied customers, significant new capabilities, dozens of new Center teammates, and 2 major and 3 minor construction projects. We have also had many challenges, including two security stand downs and dealing with beryllium contamination.

I have been very impressed with how the Center has dealt with both our successes and challenges. We have met success with humility; rather than basking in the glory of the moment, we have asked our customers to give us new challenges that will help their business grow (which

they have gladly done). We also tend to measure our success in the context of our customers' success. This customer-focused culture is why we have so much repeat business and why our customers view us as a can-do Center. This can-do attitude also helped us through the challenges of the year. Supported by our ISO systems and culture, we successfully managed two security stand downs and continuing beryllium contamination issues. I was profoundly impressed with how we were able to rapidly plan and execute the stand downs, given that our people tend to live in labs and shops as opposed to offices.

Part of this rapid reaction was renting a hotel to conduct training. This led to my realization that the Center had no conference room large enough to hold our largest departments. Upon the recommendation and with the drive and determination of Carla Chirigos, we built

a large conference room in Building 878 in record time. Another impact of the first stand down that has led to construction was a question by David Leyva, who asked why Building 878

was still outside the limited area? This inquiry led to the decision to bring most of the building back into the limited area, hence the construction activity in the rafters and hallways of the building, and the "Get Smart" door configuration in the A-Hallway. The third minor con-

Herrera, Continued, page 2

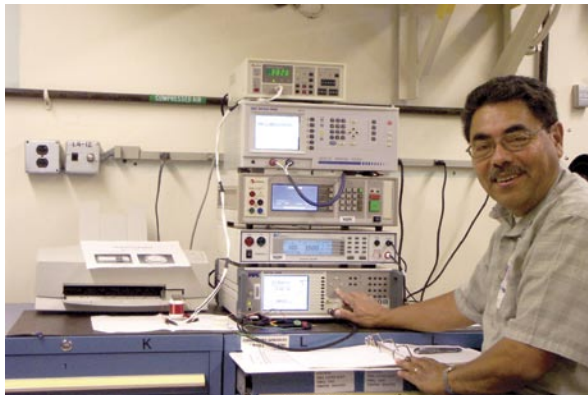


Gil Herrera

Tech Updates

Magnetics Analyzer Test System (MATS)

The Magnetics Lab now has an electrical testing system to verify the magnetic characteristics of components such as transformers, inductors, capacitors, and source resistors. The Magnetics Analyzer Test System (MATS) will provide higher accuracy measurements for continuous process improvements in the design and development of transformers for Sandia. The system is comprised of a precision magnetics analyzer that measures in frequencies from 20Hz up to 3MHz. It provides accurate testing for various coils with tests including transformer turns ratio, interwinding capacitance, interwinding coupling, Q/D factor measurements, and resonant frequency analysis. An impulse winding tester provides non-destructive analysis of high voltage transformer output pulses from 200V up to 5KV. The graphical output of the impulse tester displays component characteriza-



Meliton Gonzales Testing Transformers

tion and optimal operating conditions on a coil to minimize loss and maximize output. Other features include:

- A megohm meter for measuring very large resistances from 1 K Ω up to

100 T Ω with 0.5% accuracy.

- A milliohm meter for low resistance measurements from 2 M Ω down to 1 $\mu\Omega$ with an accuracy of 0.05%.
- A dielectric analyzer for electrical safety measurements including AC & DC dielectric withstanding (hipot) tests up to 5kV, insulation resistance (IR) tests up to 50 G Ω , and continuity measurements.

The system is equipped with Kelvin leads to offer the highest reliability connections and optimum electrical performance. The flexibility of this system allows electrical tests to be performed on magnetic components and many other electrical circuits.

Contact: Steven Anderson (505-844-6165, scander@sandia.gov)

From the Director

Continued from page 1

struction activity was the renovation of the tool crib in Bldg. 840. We can now store more tools in less area, and have a more efficient operation.

Two major construction projects are also under way. Our Center, in conjunction with Center 2600, is building a General Plant Project in the area south of the Thunderbird Cafe. Our half of the building will be all offices, and will relieve the office space situation in Bldg. 878, allow us to reclaim some laboratory space, and enable the expansion of our ceramics manufacturing capability. The latter is the second major construction project. We are engaged in a ~\$7M expansion of our ceramics manufacturing capability in support of Neutron Generator manufacturing. This is a staged project that started in June and will be completed during early FY2005. Please note that our sponsor Kathleen McCaughey, through the Manufacturing Systems Science and Technology program, is paying for both major construction projects. Please thank Kathleen next time you see her.

In addition to physical infrastructure, we also added human resources. We have or are near completing 28 external hires, including 21 from among the AMTTP graduates. We have also hired many excellent employees through the post and bid system. I am impressed with the caliber of the people who have elected

to join our Center from within and outside of Sandia.

We have had many technical and program successes throughout the year. There is not enough space in this newsletter to mention all of them here, so I will mention just a few. We developed novel exothermic thin film techniques for joining and other applications. Active ceramics components are in a positive inventory position for the first time ever. Rapid Prototyping High Density Circuitry (RpHdc) is yielding conformal interconnects on 3-D structures. We fabricated a Laser Dynamic Range Imager/Hyper Spectral Imaging Spectrometer. We led the turnaround in Gel Capacitor materials and manufacturing for a NW component, and led a cross-complex LENS qualification proposal funded by the DOE. Our ISO leadership has been acknowledged by NW. Our AMTTP achieved state certification. We are integrated into MESATOP, and several Center employees are engaged in and often leading National-level manufacturing activities.

All in all, we have had an exceptional year. I look forward to an even better year as we enter FY2005.

—Gil Herrera

Sparkplug (Continued from page 1)

and the development of new processes. These processes essentially make the insulator of a standard sparkplug into a capacitor that provides the high energy discharge. Ignition systems can create high energies, but cannot efficiently transfer that energy through the low-resistance gap. The CT technology provides a high transfer efficiency, which improves combustion, and thus power, torque and gas mileage.

CT recently conducted the FTP-75 test on a new vehicle equipped with its one-piece sparkplugs. FTP-75 is a test mandated by the Environmental Protection Agency, and largely determines the fuel economy and emissions class for vehicles. A 2 percent improvement is considered significant. CT showed a 10 percent improvement—or 5 times more than was thought possible.

Sandia is currently assisting CT in identifying potential commercial suppliers of this novel sparkplug body. Mfg. S&T personnel are R. H. Moore, M. A. Hutchinson, P. Yang, F. Uribe and J. L. Gonzales, and W. B. English.

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Lou S. Camilli, Combustion Technology (505-842-5201, lcamilli@energypulse.com)

FY05 Advanced Manufacturing LDRD

The Advanced Manufacturing LDRD (Laboratory Directed R&D) program supports Sandia's mission by advancing both our capability to fully understand and model manufacturing processes and the development of new processes and techniques to make product. We define manufacturing as the science, technology and processes to create and manage product throughout its life cycle.

The sixteen funded projects for FY05 are roughly three-quarters continuing projects and one-quarter new starts. The focus is on development of new processes, understanding of phenomena fundamental to fabrication, and new ways of fabricating components. Projects include: atomic layer deposition of tribological coatings; exothermic multilayer thin films for micro-system assembly; rapid prototyping of high-density circuitry; understanding of wetting phenomena; injection molding of active ceramic components; production of ceramic laser materials; design and manufacture of complex precision optics; and system integration in low temperature cofired ceramic (LTCC).

LDRD projects give our researchers an opportunity to explore new ideas that have the potential to have an impact in the future. We expect each of the Advanced Manufacturing LDRD projects to contribute to expanded process fabrication capabilities at Sandia and provide new solutions and opportunities to researchers and designers as they work to build product to meet Sandia's customers' needs.

—Carol Adkins (505-845-9119, cladkin@sandia.gov)

Appropriate Use of Sandia Information Resources

Sandia information resources include computers, printers, copiers, and telecommunications services or capabilities. Sandia National Laboratories (SNL) is concerned that misuse of these resources can waste time and potentially damage SNL's reputation. Employees are concerned that the rules of use are vague, making people tentative about using the resources. To help clear up any confusion, here is some information on what is appropriate incidental use of Sandia information resources.

What is Appropriate Incidental Use of Sandia Information Resources?

Employees may use Sandia's information resources as a personal convenience provided such use:

- Does not violate a Sandia Corporate Policy Statement (CPS) or Corporate Process Requirement (CPR)
- Is not an unlawful activity
- Is not a business activity for personal gain
- Is not a broadcast communication unless related to Sandia business or Sandia sanctioned activities
- Does not result in additional Sandia expense
- Does not have a negative impact on employee job performance
- Does not result in Sandia liability
- Does not waste Sandia's time
- Does not degrade Sandia's reputation or public trust

tion or public trust

- Does not require physical or logical modifications of Sandia resources to accommodate personal use, such as loading personally owned software on Sandia computers or installing/changing physical network connections.

Sandia's e-mail systems are provided as another means of communication between Sandia staff, contractors, and correspondents at other organizations where work-related communications are appropriate.

Inappropriate uses of Sandia E-mail include but are not limited to:

- Conducting private (non-Sandia) business either for profit or non-profit reasons.
- Chain letters or other pyramid-like correspondence
- Receipt or transmission of obscene materials
- Revenge or nuisance mail ("spam")

Mass mailings in support of political or other non-Sandian-sponsored activities. Here are some websites to check out for more information:

<http://www-irn.sandia.gov/policy/infrastructure/CPR400.2.13.5.htm>
<http://www-irn.sandia.gov/webmentor/proper-use/index.htm>
<http://www-irn.sandia.gov/corpdata/feedback/eeo-aa-diversity/appropemail.html>

Mfg. S&T "Under Construction"

Currently, four construction projects are in various stages of completion. One of the three, the expansion of the Building 878 room A218 conference room has been completed. The new conference room is now big enough to hold the largest department in the center. The folding door allows it to be used as one large room with a capacity of 95, or as two separate rooms (A218-North & South). The capability exists to send a separate audiovisual source to every display device (computer, plasma display, projection screen, and document camera) all at the same time or display one source to multiple display devices.

The other three construction projects are currently underway, each with a complete design package and DOE approval. The following is a status of the three projects.



New Conference Room in Bldg. 878

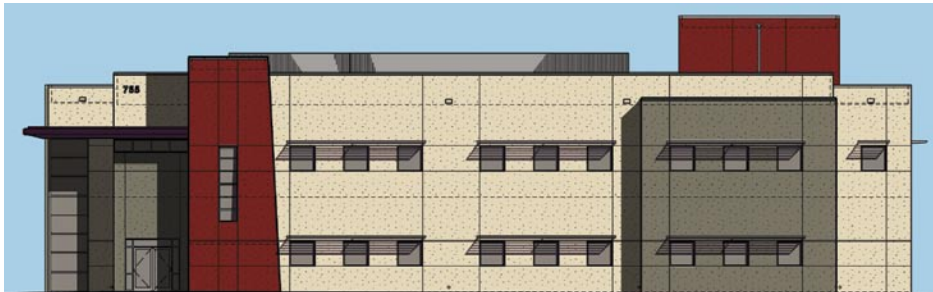
Manufacturing Science Surety Components Laboratory (MSSCIL) General Plant Project—Bldg. 755

This project is a joint venture between Mfg. S&T and Surety Components & Instrumentation, funded by the Manufacturing Systems Science and Technology Program. Mfg. S&T will occupy office space on the second floor of this building and Surety Components & Instrumentation will occupy office and labs on the first floor. Construction has begun in the parking lot west of Building 878. The estimated completion date for MSSCIL is May 2005. Employees from the Center's business office as well

as several departments will occupy the second floor of this building.

Construction

Continued from Page 3



The new Manufacturing Science Surety Components Instrumentation Laboratory (MSSCIL) General Plant Project—Bldg. 755

Building 878 Limited Area Enclosure

This project involves taking the majority of Building 878 into the Limited Area (LA). The northwest quadrant of the building (everything north of the A aisle to the intersection of the A & Y aisles) will remain Property Protection Area (PPA) to house uncleared employees, as will the management suite of offices. Two thirds of the project was completed in FY04. Funding for this project was allocated from Safeguards & Security. This construction project consists of placing structural barriers above the ceiling between the PPA and LA boundaries. Employees most affected by this project are those that occupy either side of the A aisle to the intersection to Aisle Y. They were extremely coopera-

New Permanent Employees

Corey Campbell	14150
Armando J. Fresquez	14152
Scott C. Campin	14153
Michael E. McReaken	14131-4
Leonard A. Dixon	14151-1
Grace E. Gallegos	14151-1
Christian S. Maestas	14151-1
Michael Maness	14151-1
Elizabeth B. Montgomery	14151-1
Lin Nguyen	14151-1
Kevin P. Santistevan	14151-1
Tom P. Chavez	14154-1
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Warren E. Lubin	14154-1

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tive in temporarily moving while work was being done overhead. Mick Gorospe, Sites Management building manager, working with the Facilities Design & Construction Projects lead, Marc Evans, coordinated the work of the contractors. Activating the LA swipes within Building 878, and removing the fence south of the loading dock is planned for sometime within FY05.

Active Ceramics Expansion

This project consists of expansion and remodeling within and outside of the Ceramics and Glass Vault-Type Room (VTR) in Building 878. This expansion will enable the Ceramics & Glass department to meet future active ceramics component manufacturing needs in support of Sandia's Neutron Generator production mission and is being funded by the Manufacturing Systems Science and Technology Program. As of the end of FY04, DOE project authorization for Phase I was obtained and Title I/II Design Reviews were approximately 30% complete. The anticipated construction

start date is November 16. The construction effort will proceed in two phases. The first phase will expand PZT processing areas within the VTR and relocate varistor and other development activities outside the VTR in the laboratory area located between the Y and B1100 aisles (some demolition work is already in progress in this area). This construction phase will hopefully be completed by March 2005. The second phase, scheduled for a late FY05 completion, will consist of a complete remodel of the office, grinding, assembly, and test areas within the VTR. The overall effort is being staged in such a fashion as to minimize down time with respect to active ceramics production. Considerable component inventory has been stockpiled in advance of these construction activities as a risk mitigation strategy to ensure product deliveries. There are two significant impacts to Building 878 employees resulting from this project: 1) loss of the Y aisle south of the B aisle (incorporated into Ceramics and Glass VTR); and 2) addition of two shower/change rooms off the B aisle that will be available to all 878 personnel. Chris Armijo, Active Ceramics Team Leader, and Marc Evans are coordinating activities on this project.

A special thanks to Kathleen McCaughey, Program Director, who funded both the MSSCIL building and the Active Ceramics Expansion through the Manufacturing Systems Science and Technology Program.

—Carla Chirigos (505-854-8645, cdchiri@sandia.gov)

Mike Kelly—New Manager of Organic Materials Dept.

On September 10th, Mike Kelly joined the Mfg. Science & Technology Center as the new manager of the Organic Materials Department. Mike joins the Center from Sandia's Materials and Process Sciences Center, where he served as a key interface with the nuclear weapons community and an advisor and consultant on materials compatibility issues. Mike has a Ph.D. in analytical chemistry from the University of Wisconsin

and has been with Sandia since the mid-80s. Over the years, Mike has worked



Mike Kelly

on projects for both the SEMATECH and Intel Cooperative Research and Development Agreements, served as a group leader in an analytical chemistry lab, been active in the Electrochemical Society, and has many papers and presentations to his credit. He has experience working with a diversity of customers and applying R&D to real issues. Mike is excited about joining the Center and learning about the people, customers, and work in his new department.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2004-6255P